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NATIONAL DAM INSPECTION PROGRAM. LAKE RENEE DAM (NDS ID NUMBER --ETC(U)
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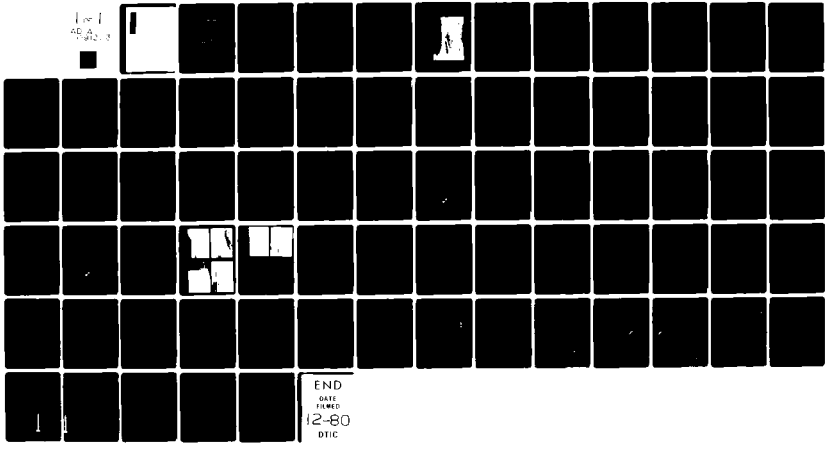

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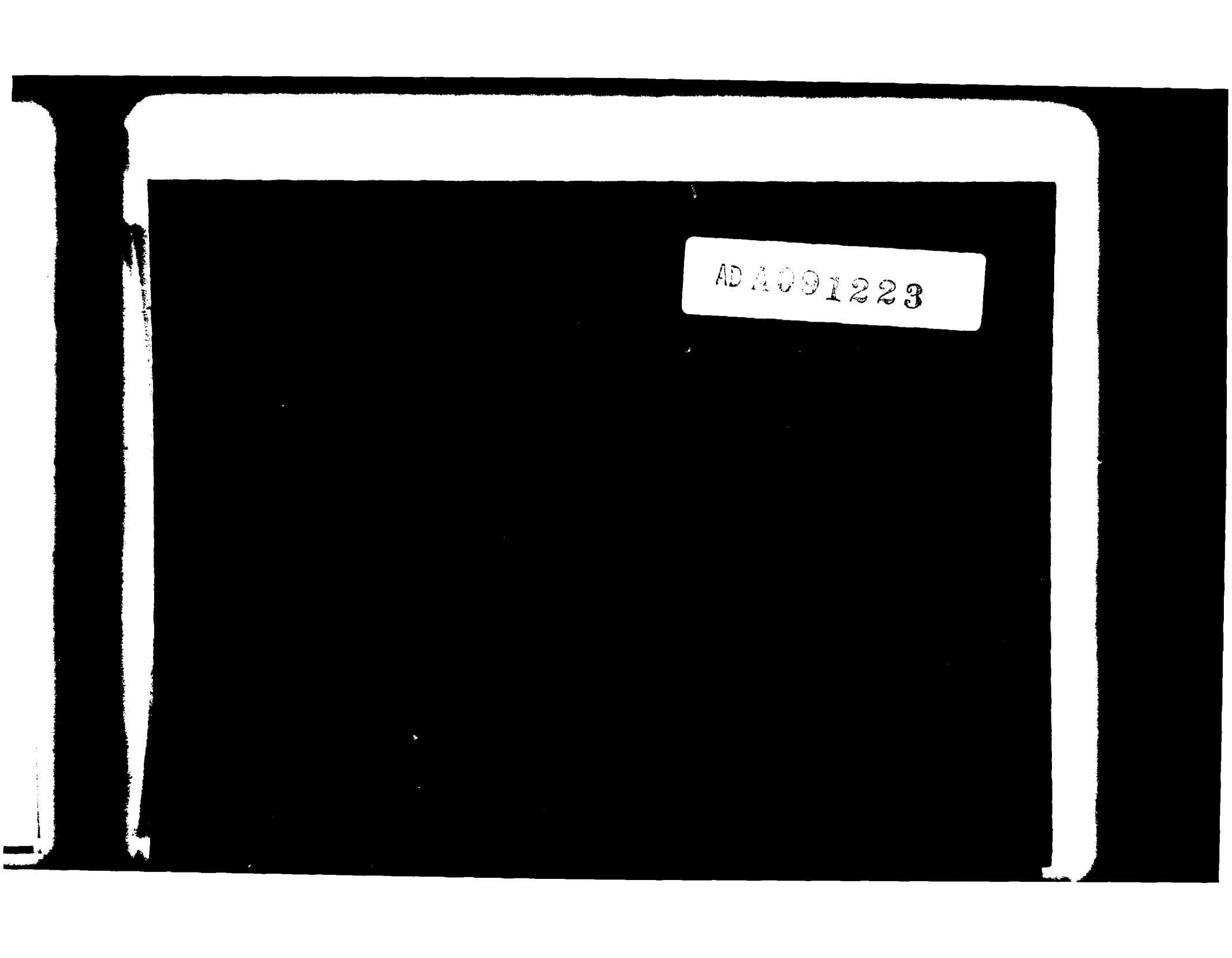


DELAWARE RIVER BASIN,
DINGMAN'S CREEK, PIKE COUNTY,
PENNSYLVANIA.

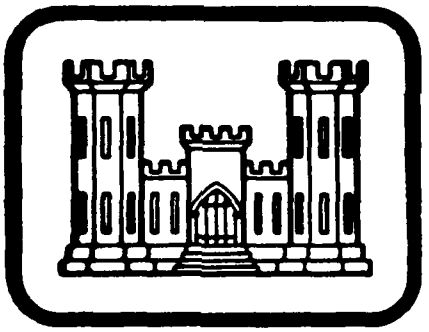
(6) National Dam Inspection Program.

LAKE RENEE DAM

(NDS ID ~~NO~~ Number PA-732,
DER ID ~~NO~~ Number 52-172).
MARCEL LAKE ESTATES.

PHASE I INSPECTION REPORT,
NATIONAL DAM INSPECTION PROGRAM

(11) Sept 1980 (12) 75



Prepared By
L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS
EBENSBURG, PENNSYLVANIA
15931

(15) DACW31-80-C-0071

FOR
DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT CORPS OF ENGINEERS
BALTIMORE, MARYLAND
21203

SEPTEMBER, 1980

411039

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in detemining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I REPORT
NATIONAL DAM INSPECTION REPORT

NAME OF DAM	Lake Renee Dam
STATE LOCATED	Pennsylvania
COUNTY LOCATED	Pike
STREAM	Tributary of Dingman's Creek
DATE OF INSPECTION	May 22, and July 30, 1980
COORDINATES	Lat: 41° 16'N Long: 74° 57.6'E

ASSESSMENT

The assessment of Lake Renee Dam is based upon visual observations made at the time of inspection, review of available records and data, hydraulic and hydrologic computations and past operational performance. The inspection and review of data for Lake Renee Dam did not reveal any problems which require emergency action. However, a low area beyond the right abutment which provides additional discharge capacity, should be provided with erosion protection. The dam otherwise appears to be in fair condition.

Lake Renee Dam is a high hazard-small size dam. The spillway design flood (SDF) for a dam of this size and classification is 1/2 PMF to the PMF. The PMF has been selected as the SDF based on the downstream potential for loss of life. The spillway and reservoir are capable of controlling 42% of the PMF, however additional discharge capacity exists beyond the right abutment and is capable of passing an additional 58% of the PMF. Survey stakes in this area noted during the July 30th inspection indicated a possibility of fill material being placed, therefore, possibility reducing the flow through this area in the future. Therefore, the dam is capable of passing the entire SDF. Based on criteria established by the Corps of Engineers, the spillway is termed as adequate.

The following recommendations and remedial measures should be instituted immediately.

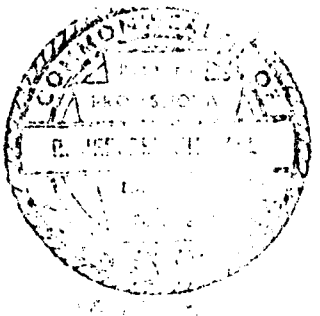
1. Additional discharge capacity exists through the low area beyond the right abutment. This area should be maintained as an auxiliary emergency spillway and it should be provided with erosion protection. If this low area is filled for any reason the calculated discharge capacity stated in this report should be reevaluated.

2. Eroded areas adjacent to the spillway wingwalls should be repaired and measures should be taken to prevent further erosion. Observed low areas on the crest of the dam should be filled to design elevations.

TOBYHANNA LAKE NO. 2 DAM
PA 779

SUBMITTED BY:

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS AND ARCHITECTS



Date

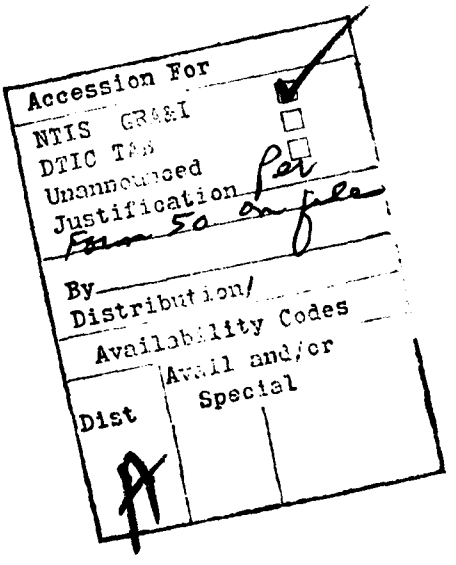
R. Jeffrey Kimball, P.E.

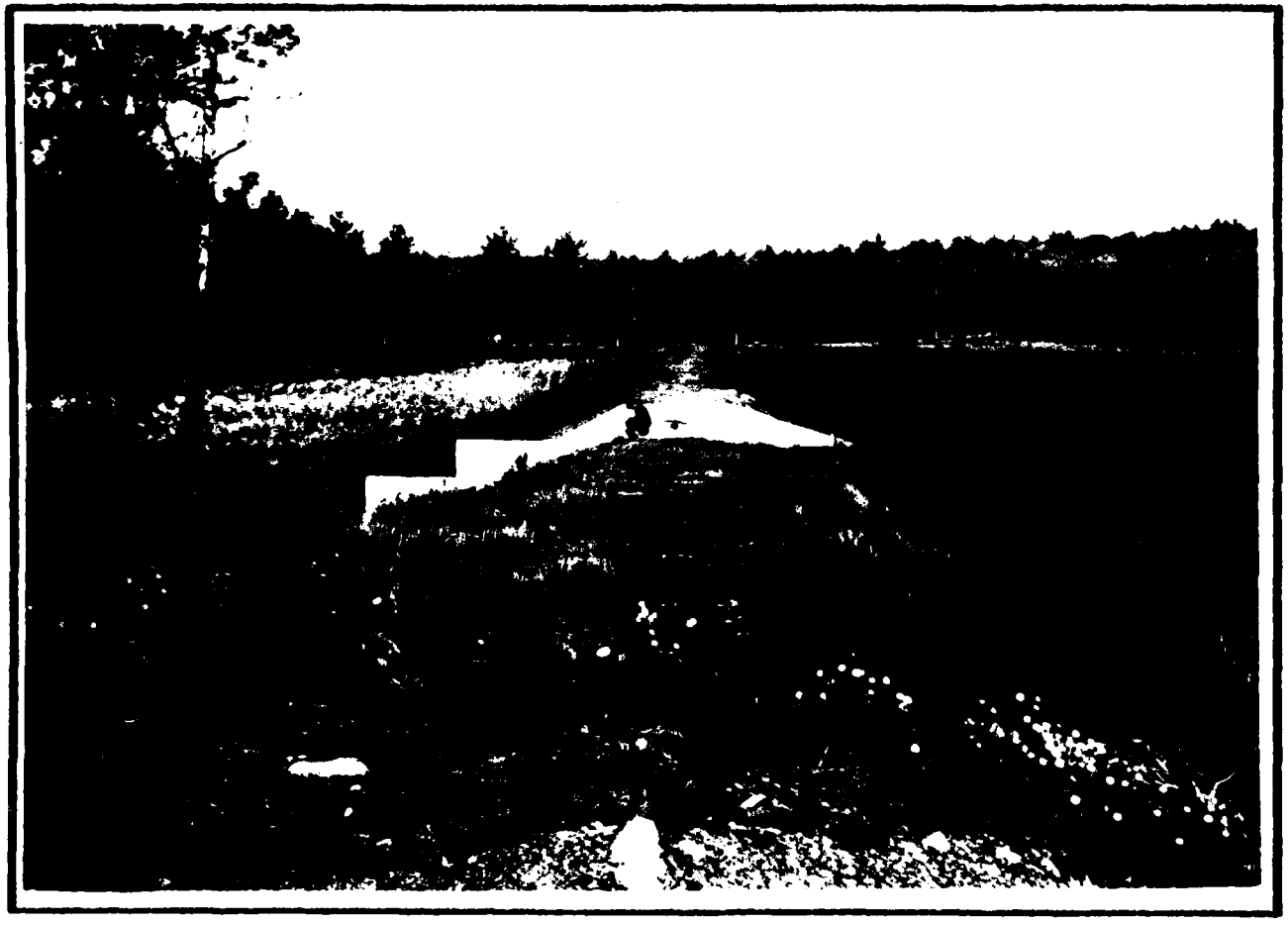
APPROVED BY:

24 Sep 1980

Date

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer





Overview of Lake Renee

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APPENDICES

PHASE I
NATIONAL DAM INSPECTION PROGRAM
LAKE RENEE DAM
NDI. I.D. NO. PA 732
DER I.D. NO. 52-172

SECTION 1
PROJECT INFORMATION

1.1 General.

a. Authority. The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Lake Renee is an earthfill dam, 10 feet high and 1200 feet long. The crest width is 10 feet. The upstream slope is 2H:1V and grass covered. The downstream slope was measured to be 2.5H:1V and is partially grass covered.

The reservoir drain consists of a 48" corrugated metal pipe located in the ogee type spillway. The spillway consists of a 56 foot long ogee section and is located 117 feet from the left abutment. Reinforced concrete retaining walls are provided along both sides of the spillway channel.

The exit channel is trapezoidal and has a transition from approximately 56 feet to 14 feet wide. The channel is protected for approximately 20 feet with reinforced concrete. The remaining portion of the channel is protected with riprap in the original streambed. Reinforced concrete cutoff walls are provided beneath the spillway. The spillway abutments are keyed into the embankment with reinforced concrete. The dam is a homogenous earthfill embankment. A cutoff trench is provided to a varying depth. The minimum bottom width of the trench is 8 feet. A mixture of bentonite and sandy loam exists along the upstream embankment slope.

b. Location. The dam is located on an unnamed tributary to Dingmans Creek, Pike County, Pennsylvania. Lake Renee Dam can be located on the Edgemere, U.S.G.S. 7.5 minute quadrangle.

c. Size Classification. Lake Renee is a small size structure (10 feet high, 432 acre-feet).

d. Hazard Classification. The hazard classification for Lake Renee has been determined to be high. Downstream conditions at the time of inspection indicated that loss of more than a few lives is probable should the structure fail. Approximately 50 homes (200 people) are located downstream of Lake Renee Dam.

e. Ownership. Lake Renee Dam is owned by Marcel Lake Estates. Correspondence should be addressed to:

Marcel Lake Estates
Dingmans Ferry, PA
717-828-2122
Attention: Tom Roselli

f. Purpose of Dam. Lake Renee Dam is used for recreation.

g. Design and Construction History. Construction of Lake Renee Dam was begun around April, 1972 and completed in late October, 1973. The dam was constructed by G.H. Litts and Sons, Inc., East Stroudsburg, Pennsylvania. The design engineer was Tom Rosselli of Monroe Engineering, East Stroudsburg, Pennsylvania. Design calculations and as-built drawings exist in the PennDER files. Construction inspection testing was performed by Northeastern Engineering Company, Inc. of Clarks Summit, Pennsylvania and the results are in the DER files. Joseph D. Sincavage, P.E. of Monroe Engineering was directly reponsible for construction supervision.

Correspondence noted that extensive excavation was necessary to provide a stable foundation for the dam. A shortage of impervious construction material resulted from this over excavation, and a mixture of bentonite and soil had to be used on the upstream face to insure an impermeable embankment.

h. Normal Operating Procedures. Weekly visits are made to the dam by a representative of Monroe Engineering and the gate valve which operates the reservoir drain is opened several times each year. The gate valve was not operated at the time of the inspection.

1.3 Pertinent Data.

a. Drainage Area. 1.58 square miles

b. Discharge at Dam Site (cfs).

Maximum known flood at dam site	Approximately 75
Drainline capacity at normal pool	Unknown
Spillway capacity at top of dam	1357 cfs

Additional discharge capacity at right abutment	1968 cfs
Combined discharge capacity	3325 cfs

c. Elevation (U.S.G.S. Datum) (feet). - Based on the spillway crest elevation 1257.3 obtained from as-built construction drawings.

Top of dam - low point	1260.8
Top of dam - design height	1262
Maximum pool - design surcharge	1261.5
Normal pool	1257.3
Spillway crest	1257.3
Additional spillway capacity (crest right abutment)	1257.3
Upstream invert - 48" drainline	Unknown
Downstream invert - 48" drainline	1251.9
Maximum tailwater	Unknown
Toe of dam	1251.5

d. Reservoir (feet).

Length of maximum pool	4750
Length of normal pool	4050

e. Storage (acre-feet).

Normal pool	163
Top of dam	432

f. Reservoir Surface (acres).

Top of dam	90
Normal pool	62
Spillway crest	62

g. Dam.

Type	Earthfill
Length	1200 feet
Height	10 feet
Top width	10 feet
Side slopes (field measured) - upstream	2H: 1V
- downstream	2.5H: 1V
Side slopes (design) - upstream	2.5H: 1V
- downstream	2H: 1V
Zoning	None
Impervious core	None
Cutoff	Pervious foundation with partial cutoff
Grout curtain	None

h. Reservoir Drain.

Type	48" corrugated metal pipe
Length	Unknown
Closure	48" gate valve
Access	Emergency spillway retaining wall
Regulating facilities	48" gate valve

i. Spillway.

Type	Concrete ogee
Length	56 feet
Crest elevation	1257.3
Upstream channel	Lake
Downstream channel	Reinforced concrete with concrete baffles at the toe

SECTION 2
ENGINEERING DATA

2.1 Design. Review of available information in the files of the Commonwealth of Pennsylvania, Department of Environmental Resources revealed several as-built construction drawings, some hydrology and stability calculations, field density results and laboratory testing results. It was indicated that the soils investigation and field inspection was conducted by Northeastern Engineering Company Inc.

2.2 Construction. Minimal information was available on the construction of the dam. Reference was made to a shortage of impervious construction material (silty sands) and a bentonite soil liner had to be constructed on the upstream slope.

2.3 Operation. A representative from Monroe Engineering visits the site weekly and the gate valve is opened several times each year. No other operations are conducted at the dam.

2.4 Evaluation.

a. Availability. The engineering data was provided by PennDER. A representative of the owner was available for interview in regard to operation and maintenance.

b. Adequacy. Information was available for review concerning the design of the dam. Minimal construction data was available for the review purposes of this report. The Phase I Report is based on visual inspection, hydrologic and hydraulic analysis. Sufficient information exists to complete a Phase I report.

SECTION 3
VISUAL INSPECTION

3.1 Findings.

a. General. The onsite inspection of Lake Renee Dam was conducted by personnel of L. Robert Kimball and Associates on May 22, 1980 and July 30, 1980. Tom Roselli of Monroe Engineering Company met with the inspection team prior to the inspection. The inspection consisted of:

1. Visual inspection of the retaining structure, abutments and toe.
2. Examination of the spillway facilities, exposed portion of any outlet works and other appurtenant works.
3. Observations affecting the runoff potential of the drainage basin.
4. Evaluation of the downstream area hazard potential.

b. Dam. The dam appears to be in fair condition. From a brief survey conducted during the inspection it was noted that the main embankment crest is uneven with a low spot near the left abutment. The upstream and downstream slope are partially grass covered. The embankment crest is not grass covered. The crest width is measured to be 10 feet. The upstream slope was measured to be 2H:1V. The downstream slope is 2.5H:1V. Erosion was noted on the downstream slope adjacent to the spillway wingwalls. The potential for further erosion exists along the downstream slope adjacent to both spillway wingwalls.

The high grass on the slopes made visual inspection difficult. An extensive swampy area was noted along the entire downstream toe area. The U.S.G.S. quadrangle shows this area before construction of the dam to be swampy. No seepage was noted in this area.

c. Appurtenant Structures. The water level at the time of inspection was at elevation 1257.3. The spillway appeared to be in good condition. There was no evidence of deterioration of the concrete. The spillway discharge channel immediately below the spillway structure contained concrete baffles. The discharge channel had a transition zone from 56 feet near the spillway to approximately 12 feet in the natural stream channel.

The drainline for the reservoir consists of a 48" corrugated metal pipe. The reservoir drain is located within the concrete spillway section, a gate valve controlling the flow through the drain pipe is operated from the retaining wall of the spillway.

A low area beyond the right abutment of the dam was observed during the inspection. It was concluded by the inspecting team that the area had a potential to provide additional discharge capacity for the dam. During the second inspection to the site this right abutment area contained numerous survey stakes showing the location of a new roadway and/or sewer line and lot boundaries. If construction takes place in this area the additional discharge capacity in the area may be reduced substantially.

d. Reservoir Area. The watershed is covered mostly with timberland. The reservoir slopes are gentle to moderate and do not appear to be susceptible to massive landslides which would effect the storage volume of the reservoir or cause overtopping of the dam by displacing water.

e. Downstream Channel. The downstream channel at the Lake Renee Dam is formed by Dingmans Creek. Marcel Lake is located approximately .25 miles downstream.

3.2 Evaluation. In general, the embankment appeared to be in fair condition. The spillway and drainline regulating facilities appeared to be in good condition and adequately maintained.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures. The water level is maintained at the spillway crest at elevation 1257.3. A representative of the owner, Mr. Tom Rosselli, was interviewed at the time of inspection. He indicated that Monroe Engineering conducted weekly visits to the dam and that the gate valve controlling the drainline is operated several times a year.

4.2 Maintenance of the Dam. No planned maintenance schedule exists for the dam. Weekly visits are made to the dam by representatives of Monroe Engineering and operation of the gate valve is reported to occur several times each year.

4.3 Maintenance of Operating Facilities. Maintenance of the operating facilities appears to be good. It was indicated that the drainline is operated several times a year.

4.4 Warning System in Effect. There is no known warning system in effect to warn downstream residents or property owners of large spillway discharge or imminent failure of the dam.

4.5 Evaluation. The condition of the operating facilities is good, however, there is no known warning system in effect to warn downstream residents.

SECTION 5
HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features.

a. Design Data. The PennDER files contained some design calculations concerning spillway size as well as the wastewater channel and outlet conduit hydraulics. However, the available data was for a trial section rather than the design section.

b. Experience Data. No rainfall, or runoff data were available, a maximum water level of about 6 inches over the weir was reported by the owner. The spillway reportedly functioned adequately with this maximum water level flow.

c. Visual Observations. The spillway appeared to be in good condition, although some erosion was noted on the downstream slope along both wingwalls. A low area was observed beyond the right abutment. This area was considered as being capable of providing additional discharge capacity for the dam. Survey stakes in this area noted during the July 30th inspection indicated a possibility of fill material being placed, therefore, possibly reducing the flow through this area in the future.

d. Overtopping Potential. Overtopping potential was investigated through the development of the probable maximum flood (PMF) for the watershed and the subsequent routing of the PMF and fractions of the PMF through the reservoir and spillway.

The Corps of Engineers, Baltimore District, has directed that the HEC-1 Dam Safety Version systemized computer program be utilized. The program was prepared by the Hydrologic Engineering Center (HEC), U.S. Army Corps of Engineers, Davis, California, July, 1978. The major methodologies or key input data for this program are discussed briefly in Appendix D.

5.2 Evaluation Assumptions. To enable us to complete the hydraulic and hydrologic analysis for this structure, it was necessary to make the following assumptions.

1. Pool elevation prior to the storm was at elevation 1257.3.

2. Additional discharge capacity noted during the visual inspection exists at the right abutment and flow through this area was considered safe to an elevation of 1260.8'. Discharge above this elevation was considered sufficient to cause erosion of the embankment, therefore, providing potential for failure of the structure due to overtopping.

3. Top of the dam was considered to be the embankment low spot at an elevation of 1260.8.

5.3 Summary of Overtopping Analysis. Complete summary sheets for the computer output are presented in Appendix D.

Peak inflow (PMF)	3390 cfs
Spillway capacity	1357 cfs
Additional discharge capacity	1968 cfs
Combined discharge capacity	3325 cfs

a. Spillway Adequacy Rating. The Spillway Design Flood (SDF) for a dam of this size and classification is the range of 1/2 PMF to PMF. The SDF for this dam was selected to be the PMF based on the downstream potential for loss of life. Based on the following definition provided by the Corps of Engineers, the spillway is rated as adequate as a result of our hydrologic analysis.

> Adequate - All high hazard dams which pass the spillway design flood PMF.

The spillway and reservoir are capable of controlling 42% of the PMF without overtopping the dam. However, additional spillway capacity on the right abutment observed at the time of inspection controls an additional 58% of the PMF. Therefore the dam is capable of passing the entire PMF storm.

Future construction may fill the low area beyond the right abutment thus reducing the additional discharge capacity. If any changes are made to this area the hydrology and hydraulics should be reevaluated by a registered professional engineer knowledgeable in dam design and construction.

5.4 Summary of Dam Breach Analysis. As the dam design can satisfactorily pass the PMF without failure (based on our analysis) it was not necessary to perform a dam breach analysis and downstream routing of the flood wave.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. Minor erosion on the downstream embankment slope adjacent to both wingwalls was observed during the inspection. The embankment material appeared to be highly erosive and it would not withstand any measureable duration or amount of overtopping before failure.

The entire downstream toe of the dam is hidden from view by water impounded in a swampy area. No seepage was visable on the downstream slope but no evaluation as to possible seepage beyond the toe could be made.

b. Design and Construction Data. Several as-built construction drawings and hand calculations exist in the PennDER files. A stability analysis was performed on a trial section of the dam but not on the design section. It appears this analysis was for stability against sliding at the base of the embankment, and not for slope stability. A factor of safety of 8.0 was obtained against sliding.

c. Operating Records. No operating records are known to exist. However, it was reported by the owner that representatives of Monroe Engineering make weekly visits to the dam site and that the gate valve controlling the drain pipe is operated several times each year.

d. Post Construction Changes. No post construction changes are known to have occurred since the structure was completed in 1973.

e. Seismic Stability. The dam is located in seismic zone 1. No seismic stability analyses has been performed. Normally, it can be considered that if a dam in this zone is stable under static loading conditions, it can be assumed safe for any expected earthquake loading. This dam showed no signs of instability. No adequate stability analysis is known to exist for this dam.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. The dam appears to be in fair condition. The low area beyond the right abutment which provides the additional discharge capacity has no erosion protection. The area beyond the right abutment should be maintained as an auxiliary spillway. No signs of immediate instabiiity were observed during the inspection. A low spot elevation of 1260.8 was observed near the left abutment. Erosion was occurring on the downstream slope adjacent to both wingwalls of the spillway. The potential for further erosion in this area and for erosion on the entire embankment exists. No signs of seepage were detected at the time of inspection, however the swampy condition at the toe and the degree of vegetation on the downstream slope made it impossible to determine seepage at or beyond the toe. A planned maintenance schedule should be developed to assure that the crest and slopes of the dam as well as the appurtenant structures are adequately maintained. Low areas on the crest should be filled to top of dam design elevations. Visual observations, review of available data, hydrologic and hydraulic calculations indicate that the Lake Renee's spillway is adequate if the additional discharge capacity beyond the right abutment is taken into consideration as noted during the visual inspection.

b. Adequacy of Information. Sufficient information is available to complete a Phase I Report.

c. Urgency. The recommendations suggested below should be implemented immediately.

d. Necessity for Further Investigation. In order to accomplish some of the recommendations/remedial measures outlined below, further investigations will be required.

7.2 Recommendations/Remedial Measures.

1. Additional discharge capacity exists through the low area beyond the right abutment. This area should be maintained as an auxiliary emergency spillway and it should be provided with adequate erosion protection. If this low area is filled for any reason the calculated discharge capacity stated in this report should be reevaluated.

2. Eroded areas adjacent to the spillway wingwalls should be repaired and measures should be taken to prevent further erosion. Observed low areas on the crest of the dam should be filled to design elevations.

3. A warning system should be developed to warn downstream residents of large spillway discharges or imminent failure of the dam.

4. The grass on the embankment slopes should be mowed on a regular basis to allow visual inspections of the slopes. A swamp area exists at and beyond the toe. High grass should not be allowed to exist near the toe so as to allow inspection of this area.

5. A safety inspection program should be implemented with inspections at regular intervals by qualified personnel.

APPENDIX A
CHECKLIST, VISUAL INSPECTION, PHASE I

CHECK LIST
VISUAL INSPECTION
PHASE I

NAME OF DAM Lake Renee Dam COUNTY Pike STATE Pennsylvania ID# 732

TYPE OF DAM Earthfill HAZARD CATEGORY High

DATE(s) INSPECTION May 22, 1980 July 30, 1980 WEATHER Clear and warm TEMPERATURE Seasonal

POOL ELEVATION AT TIME OF INSPECTION 1257.3 M.S.L. TAILWATER AT TIME OF INSPECTION 1251.5 M.S.L.

INSPECTION PERSONNEL:

R. Jeffrey Kimball, P.E. - L. Robert Kimball and Associates

James T. Hockensmith - L. Robert Kimball and Associates

O.T. McConnell - L. Robert Kimball and Associates

Cameron Mock - L. Robert Kimball and Associates

James T. Hockensmith RECORDER

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Minor erosion of the downstream slope adjacent to both spillway wingwalls.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Low spot on the left abutment. Top of dam elevation considered to be 1260.8.	
RIPRAP FAILURES	None.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VEGETATION	The upstream and downstream slopes are partially grass covered. The crest is not grass covered.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Appears to be good except for erosion near both spillway wingwalls and a low spot near the left abutment.	
ANY NOTICEABLE SEEPAGE	None observed.	
STAFF GAUGE AND RECORDER	None.	
DRAINS	None.	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	Not applicable.	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Not applicable.	
DRAINS	Not applicable.	
WATER PASSAGES	Not applicable.	
FOUNDATION	Not applicable.	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Not applicable.	
STRUCTURAL CRACKING	Not applicable.	
VERTICAL AND HORIZONTAL ALIGNMENT	Not applicable.	
MONOLITH JOINTS	Not applicable.	
CONSTRUCTION JOINTS	Not applicable.	
STAFF GAUGE OR RECORDER	Not applicable.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Not applicable.	
INTAKE STRUCTURE	Not applicable.	
OUTLET STRUCTURE	Not applicable.	
OUTLET CHANNEL	Not applicable.	
EMERGENCY GATE	Not applicable.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Concrete structure, ogee shaped weir appears to be in good condition.	
APPROACH CHANNEL	Lake. No obstructions noted during inspection.	
DISCHARGE CHANNEL	Trapezoidal transistion from 56 feet to 12 feet downstream with outlet into the natural stream.	
BRIDGE AND PIERS	None.	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Not applicable.	
APPROACH CHANNEL	Not applicable.	
DISCHARGE CHANNEL	Not applicable.	
BRIDGE AND PIERS	Not applicable.	
GATES AND OPERATION EQUIPMENT	Not applicable.	

DOWNSTREAM CHANNEL

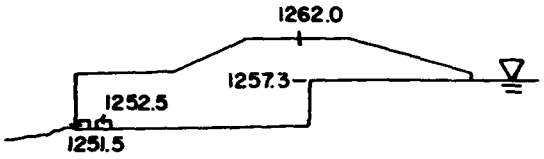
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Lake Renee provides the headwater for Marcel Lake located directly downstream of Lake Renee.	
SLOPES	Appear to be stable.	
APPROXIMATE NO. OF HOMES AND POPULATION	Marcel Lake Estates located downstream of Lake Renee. Approximately 50 homes/200 people.	

RESERVOIR

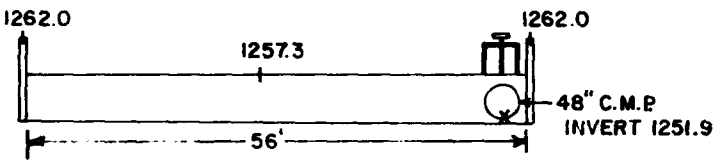
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Gentle slopes. Appear to be stable.	
SEDIMENTATION	Unknown.	

INSTRUMENTATION

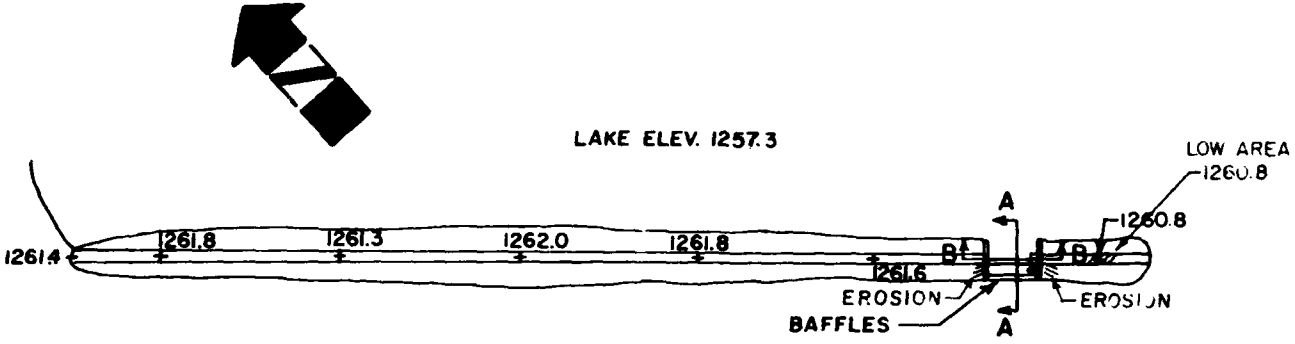
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None.	
OBSERVATION WELLS	None.	
WEIRS	None.	
PIEZOMETERS	None.	
OTHER	None.	



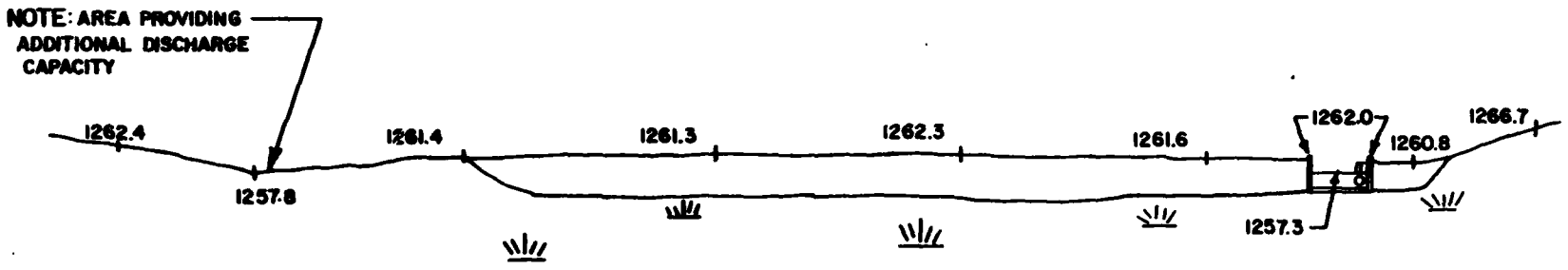
SPILLWAY STRUCTURE
SECTION A–A
Scale: 1" = 20'



SECTION B–B
Scale: 1" = 20'



LAKE RENEE DAM
Scale: 1" = 200'



A-13

PROFILE
LOOKING UPSTREAM

Scale: Horiz. 1" = 200'
Vert. 1" = 50'

LAKE RENEE DAM

APPENDIX B
CHECKLIST, ENGINEERING DATA, DESIGN, CONSTRUCTION, OPERATION, PHASE I

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Lake Renee Dam

ID# 732

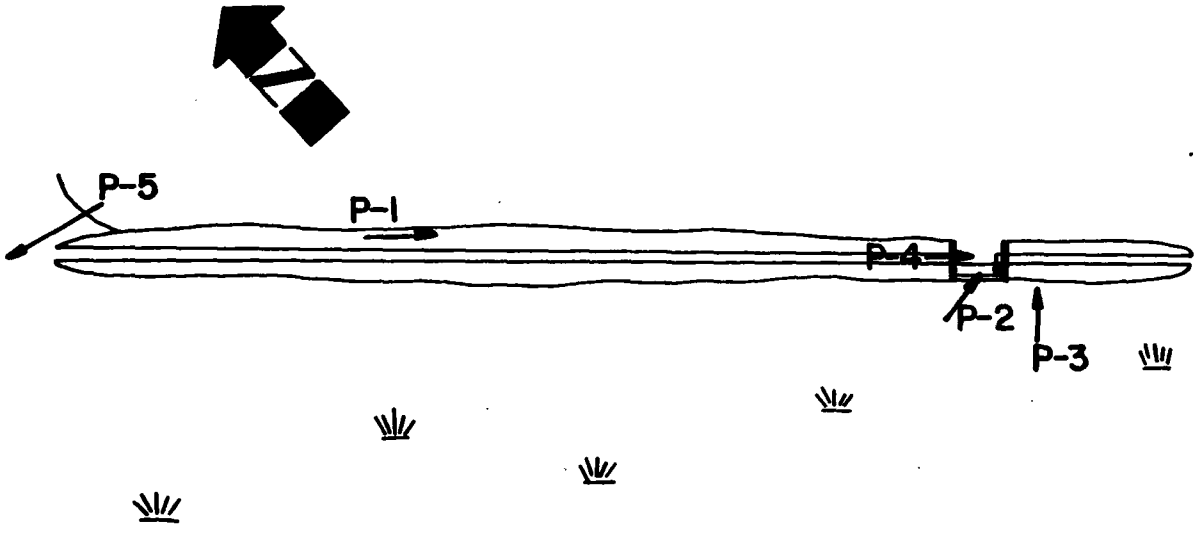
ITEM	REMARKS
AS-BUILT DRAWINGS	Several including cross-sections, waste water channel, outlet conduit, spillway plan, embankment profile in DER files.
REGIONAL VICINITY MAP	U.S.G.S. quadrangle.
CONSTRUCTION HISTORY	Constructed by G.H. Litts & Son Inc. of East Stroudsburg, Pennsylvania. Other information is minimal.
TYPICAL SECTIONS OF DAM	Several cross-sections are available in DER files.
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS RAINFALL/RESERVOIR RECORDS	Waste water channel and outlet conduit. None. None. None. None.

ITEM	REMARKS
DESIGN REPORTS	None.
GEOLOGY REPORTS	None.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	DER files.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Miminal information in DER files.
POST-CONSTRUCTION SURVEYS OF DAM	Unknown.
BORROW SOURCES	On site

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	None since construction completed in 1973.
HIGH POOL RECORDS	None.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Unknown.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None.
MAINTENANCE OPERATION RECORDS	No known records exist, however it was reported that weekly inspections of the dam occur and that the drainline gate valve is operated several times a year.

ITEM	REMARKS
SPILLWAY PLAN SECTIONS DETAILS	DER files.
OPERATING EQUIPMENT PLANS & DETAILS	Construction drawings.

APPENDIX C
PHOTOGRAPHS



C-1

PHOTO INDEX
LAKE RENEE DAM
SCALE: 1" = 200'

P - INDICATES PHOTO LOCATION

LAKE RENEE DAM
PA 732

Photograph Descriptions

Sheet 1

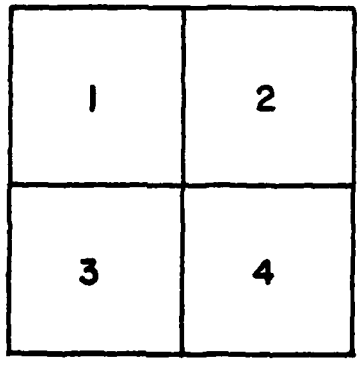
Front

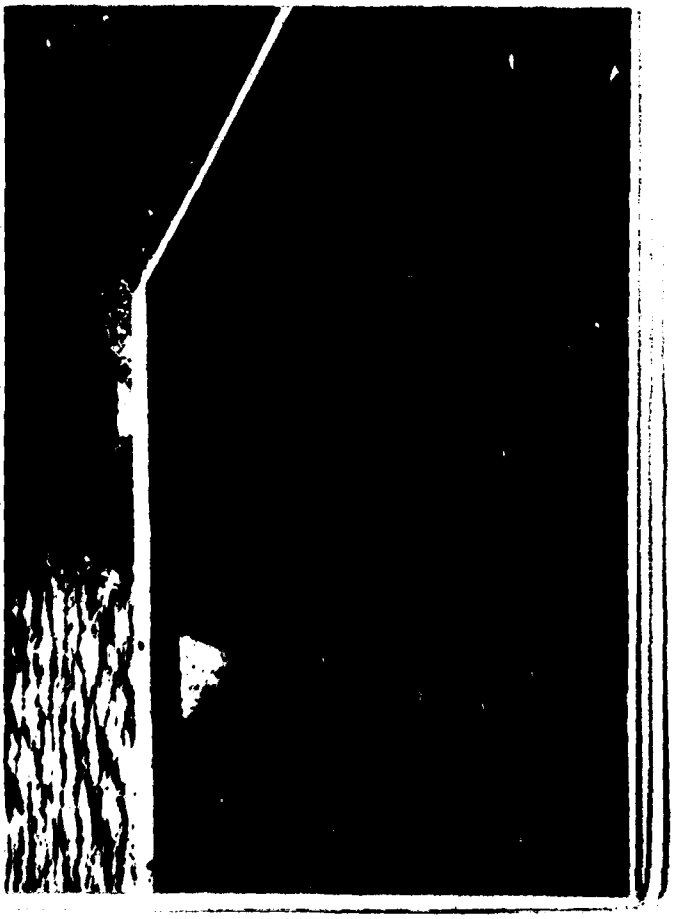
(1) Upper left - Embankment crest looking toward spillway and left abutment.
(2) Upper right - Left spillway wingwall and valve control.
(3) Lower Left - Reservoir drain, 48" CMP.
(4) Lower right - Erosion along right spillway wingwall.

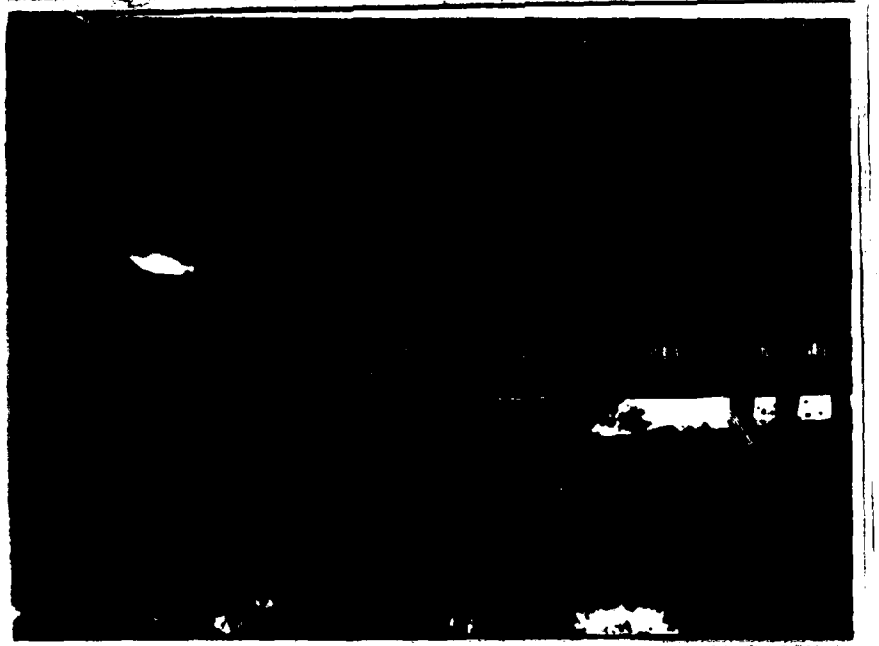
Back

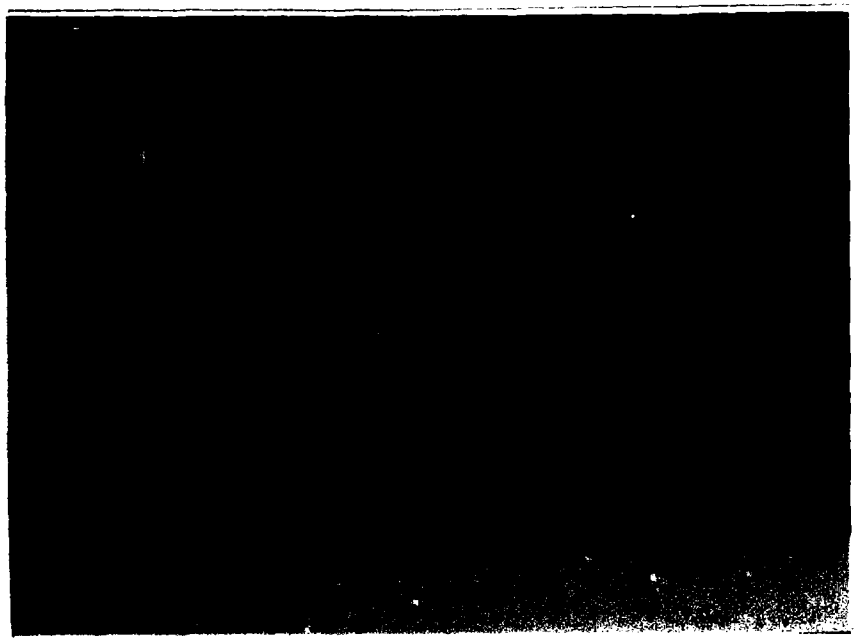
(5) Upper left - Area providing addition discharge capacity beyond right abutment.
(6) Upper right - Downstream exposure.

TOP OF PAGE









APPENDIX D
HYDROLOGY AND HYDRAULICS

APPENDIX D
HYDROLOGY AND HYDRAULICS

Methodology. The dam overtopping and breach analyses were accomplished using the systemized computer program HEC-1 (Dam Safety Investigation), September, 1978, prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California. A brief description of the methodology used in the analysis is presented below.

1. Precipitation. The Probable Maximum Precipitation (PMP) is derived and determined from regional charts prepared from past rainfall records including "Hydrometeorological Report No. 40" prepared by the U.S. Weather Bureau.

The index rainfall is reduced from 10% to 20% depending on watershed size by utilization of what is termed the HOP Brook adjustment factor. Distribution of the total rainfall is made by the computer program using distribution methods developed by the Corps.

2. Inflow Hydrograph. The hydrologic analysis used in development of the overtopping potential is based on applying a hypothetical storm to a unit hydrograph to obtain the inflow hydrograph for reservoir routing.

The unit hydrograph is developed using the Snyder method. This method requires calculation of several key parameters. The following list gives these parameters their definition and how they were obtained for these analysis.

Parameter	Definition	Where Obtained
Ct	Coefficient representing variations of watershed	From Corps of Engineers*
L	Length of main stream channel miles	From U.S.G.S. 7.5 minute topgraphic
Lca	Length on main stream to centroid of watershed	From U.S.G.S. 7.5 minute topographic
Cp	Peaking coefficient	From Corps of Engineers*
A	Watershed size	From U.S.G.S. 7.5 minute topographic

*Developed by the Corps of Engineers on a regional basis for Pennsylvania.

3. Routing. Reservoir routing is accomplished by using Modified Plus routing techniques where the flood hydrograph is routed through reservoir storage. Hydraulic capacities of the outlet works, spillways and the crest of the dam are used as outlet controls in the routing.

The hydraulic capacity of the outlet works can either be calculated and input or sufficient dimensions input and the program will calculate an elevation discharge relationship.

Storage in the pool area is defined by an area - elevation relationship from which the computer calculates storage. Surface areas are either planimetered from available mapping or U.S.G.S. 7.5 minute series topographic maps or taken from reasonably accurate design data.

4. Dam Overtopping. Using given percentages of the PMF the computer program will calculate the percentage of the PMF which can be controlled by the reservoir and spillway without the dam overtopping.

5. Dam Breach and Downstream Routing. The computer program is equipped to determine the increase in downstream flooding due to failure of the dam caused by overtopping. This is accomplished by routing both the pre-failure peak flow and the peak flow through the breach (calculated by the computer with given input assumptions) at a given point in time and determining the water depth in the downstream channel. Channel cross-sections taken from U.S.G.S. 7.5 minute topographic maps were used in the downstream flood wave routing. Pre and post failure water depths are calculated at locations where cross-sections are input.

HYDROLOGY AND HYDRAULICS ANALYSIS
DATA BASE

NAME OF DAM: Lake Renee

PROBABLE MAXIMUM PRECIPITATION (PMP) = 21.52

STATION	1	2	3
Station Description	Lake Renee		
Drainage Area (square miles)	1.58		
Cumulative Drainage Area (square miles)	1.58		
Adjustment of PMF for Drainage Area (%)(1)			
6 hours	111		
12 hours	121		
24 hours	131		
48 hours	142		
72 hours			
Snyder Hydrograph Parameters			
Zone (2)	1		
Cp (3)	.45		
Ct (3)	1.23		
L (miles) (4)	2.32		
Lca (miles) (4)	1.14		
tp = Ct(LxLca) 0.3 hrs.	1.65		
Spillway Data			
Crest Length (ft)	56		
Freeboard (ft)	3.5		
Discharge Coefficient	3.7		
Exponent	1.5		

(1) Hydrometeorological Report 33 (Figure 1), U.S. Army Corps of Engineers, 1965, Zone 1.

(2) Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's coefficients (C_p and C_t).

(3) Snyder's Coefficients.

(4) L=Length of longest water course from outlet to basin divide. L_{ca}=Length of water course from outlet to point opposite the centroid of drainage area.

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: D.A. 1.58 mi^2 gentle to moderate slopes

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 176 ac-ft

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 432 ac-ft

ELEVATION MAXIMUM DESIGN POOL: 1261.5

ELEVATION TOP DAM: 1260.8 - low spot

SPILLWAY CREST:

a. Elevation 1257.3
b. Type Ogee
c. Width N/A
d. Length 56'
e. Location Spillover 117' from left abutment
f. Number and Type of Gates One 48" gate valve on upstream face of crest.

OUTLET WORKS:

a. Type 48" CMP
b. Location Upstream face of ogee spillway
c. Entrance inverts Unknown
d. Exit inverts 1251.9
e. Emergency draindown facilities 48" CMP

HYDROMETEOROLOGICAL GAUGES:

a. Type None
b. Location None
c. Records None

MAXIMUM NON-DAMAGING DISCHARGE: Unknown

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS
EBENSBURG PENNSYLVANIA

DAM NAME LAKE RENEE
I.D. NUMBER PA 732
SHEET NO. 1 OF 3
BY CAB DATE 6-26-80

Loss Rate And Base Flow Parameters

As recommended by Corps of Engineers Baltimore District.

STRTL = 1 INCH

CNSTL = .05 IN/HR

STRTQ = .5 CFS/MI²

QRCSN = .05 (5% OF PEAK FLOW)

RTIOR = 2.0

Elevation - Area - Capacity Relationships

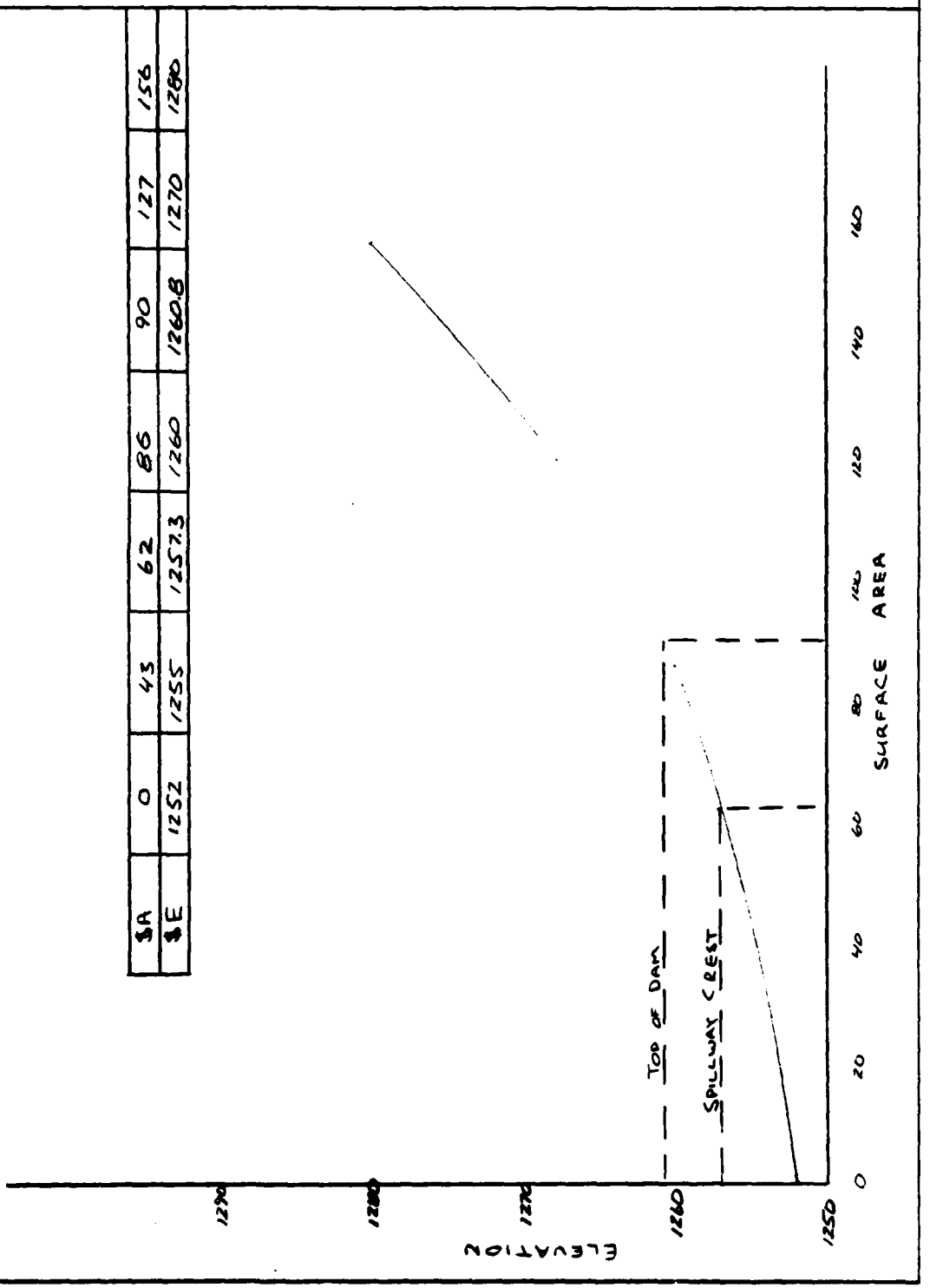
From USGS. 7.5 min. Quad., DER files and field inspection data.

ELEV WHERE AREA EQUALS ZERO = 1252
AREA AT ELEV. 1257.3 = 62 AC
AREA AT ELEV. 1260 = 86 AC.
AREA AT ELEV. 1280 = 156 AC
SPILLWAY CREST ELEV = 1257.3

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS
EBENSBURG PENNSYLVANIA

DAM NAME LAKE RENEE
I.D. NUMBER PA 732
SHEET NO. 2 OF 3
BY CAB DATE 6-26-80

$A	0	43	62	86	90	127	156
$E	1252	1255	1257.3	1260	1260.8	1270	1280



L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS
EBENSBURG PENNSYLVANIA

DAM NAME LAKE RENEE
I.D. NUMBER PA 732
SHEET NO. 3 OF 3
BY CAB DATE 6-26-80

OVERTOP PARAMETERS

TOP OF DAM ELEV. = 1260.8
LENGTH OF DAM (EXCLUDING SPILLWAY) = 1144
COEFFICIENT OF DISCHARGE = 3.1

$L	25	225	400	775	1300	1625
$V	1258	1260	1261	1261.5	1262	1262.5

1637.	1725
1263	1265

DISCHARGE RATING CURVE

DETERMINED BY HEC-1 COMPUTER PROGRAM

CREST ELEV = 1257.3
CREST LENGTH = 56'
COEFFICIENT OF DISCHARGE = 3.7
$Q_{SPILLWAY} = CLH^{3/2} = (3.7)(56)[1260.8-1257.3] = 1356.7$ cfs

NOTE: ADDITIONAL DISCHARGE CAPACITY EXISTS BEYOND THE RIGHT ABUTMENT. DISCHARGE THROUGH THIS AREA WILL BE INVESTIGATED BY THE #L, #V (HEC-1) PROGRAM OPTION. DAM OVERTOPPING WILL NOT BE CONSIDERED UNTIL ELEVATION 1260.8

$Q_{ADDITIONAL} = Q_{TOTAL} - Q_{SPILLWAY}$
$= 3325 - 1357$
$= 1968$ cfs

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  26 FEB 79
**********
    1                 AI      ANALYSIS OF DAM OVERTOPPING USING RATIOS OF THE PMF
    2                 A2      HYDROLOGIC-HYDRULIC ANALYSIS OF THE SAFETY OF LAKE RENEE DAM
    3                 A3      RATIOS OF THE PMF ROUTED THROUGH THE RESERVOIR (732)
    4                 B     288       0      10       0       0       0       0       0      -4       0
    5                 B1      5
    6                 J       1       5       1
    7                 J1     .2      .3      .4      .5       1                       1
    8                 K       0       1                                               1
    9                 K1      INFLOW TO LAKE RENEE
   10                 M       1       1    1.58
   11                 P             21.52     111     121     131     142
   12                 T                                                       1.0     .05
   13                 W    1.65     .45
   14                 X   -1.5    -.05     2.0
   15                 K       1       2                                               1
   16                 K1      ROUTE THROUGH RESERVOIR
   17                 Y                                       1       1
   18                 Y1      1                                               1257.30
   19                 $A      0      43      62      86      90     127     156
   20                 $E   1252    1255  1257.3    1260  1260.8    1270    1280
   21                 $S 1257.3      56     3.7     1.5
   22                 $D 1260.8     3.1     1.5    1144
   23                 $L     25     225     400     775    1300    1625    1637    1725
   24                 $V   1258    1260    1261  1261.5    1262  1262.5    1263    1265
   25                 K      99
```

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
****

RUN DATE= 80/08/06.
TIME= 05.30.42.

ANALYSIS OF DAM OVERTOPPING USING RATIOS OF THE PMF
HYDROLOGIC-HYDRULIC ANALYSIS OF THE SAFETY OF LAKE RENEE DAM
RATIOS OF THE PMF ROUTED THROUGH THE RESERVOIR (732)

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
288	0	10	0	0	0	0	0	-4	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 5 LRTIO= 1

RTIOS= .20 .30 .40 .50 1.00

****

SUB-AREA RUNOFF COMPUTATION

INFLOW TO LAKE RENEE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	1.58	0.00	1.58	0.00	0.000	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	21.52	111.00	121.00	131.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 1.65 CP= .45 NTA= 0

RECESSION DATA
STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH 90 END-OF-PERIOD ORDINATES, LAG= 1.67 HOURS, CP= .45 VOL= 1.00

8.	30.	61.	98.	140.	183.	221.	251.	272.	282.
278.	263.	247.	232.	217.	204.	192.	180.	169.	158.
149.	140.	131.	123.	116.	108.	102.	96.	90.	84.

79.	74.	70.	65.	61.	58.	54.	51.	48.	45.
42.	39.	37.	35.	33.	31.	29.	27.	25.	24.
22.	21.	20.	18.	17.	16.	15.	14.	13.	13.
12.	11.	10.	10.	9.	9.	8.	8.	7.	7.
6.	6.	6.	5.	5.	5.	4.	4.	4.	4.
3.	3.	3.	3.	3.	2.	2.	2.	2.	2.

END-OF-PERIOD FLOW

0 MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	24.45	22.03	2.41	126019.
										(621.)(	560.)(	61.)(	3568.46)

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE THROUGH RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1257.	0

SURFACE AREA=	0.	43.	62.	86.	90.	127.	156.
CAPACITY=	0.	43.	163.	362.	432.	1426.	2838.
ELEVATION=	1252.	1255.	1257.	1260.	1261.	1270.	1280.

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
1257.3	56.0	3.7	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
1260.8	3.1	1.5	1144.

CREST LENGTH	25.	225.	400.	775.	1300.	1625.	1637.	1725.
AT OR BELOW ELEVATION	1258.0	1260.0	1261.0	1261.5	1262.0	1262.5	1263.0	1265.0

PEAK OUTFLOW IS 542. AT TIME 43.00 HOURS

PEAK OUTFLOW IS 865. AT TIME 42.67 HOURS

PEAK OUTFLOW IS 1193. AT TIME 42.50 HOURS

PEAK OUTFLOW IS 1523. AT TIME 42.33 HOURS

PEAK OUTFLOW IS 3208. AT TIME 42.00 HOURS

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .20	RATIO 2 .30	RATIO 3 .40	RATIO 4 .50	RATIO 5 1.00
HYDROGRAPH AT	1	1.58	1	678.	1017.	1356.	1695.	3390.
		(4.09)		(19.20)(	28.80)(	38.40)(	48.00)(	95.99)(
ROUTED TO	2	1.58	1	542.	865.	1193.	1523.	3208.
		(4.09)		(15.34)(	24.51)(	33.80)(	43.11)(	90.85)(

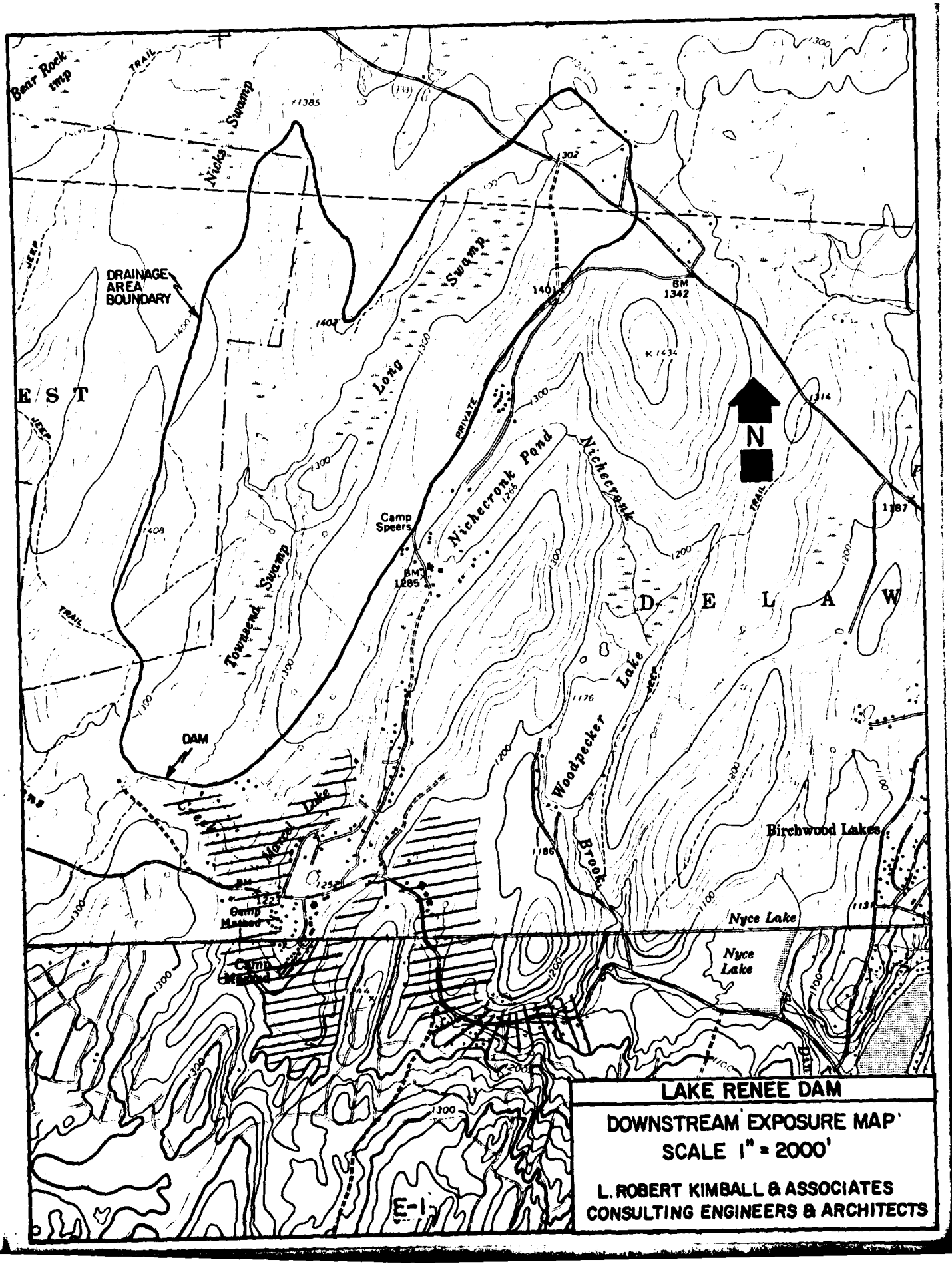
SUMMARY OF DAM SAFETY ANALYSIS

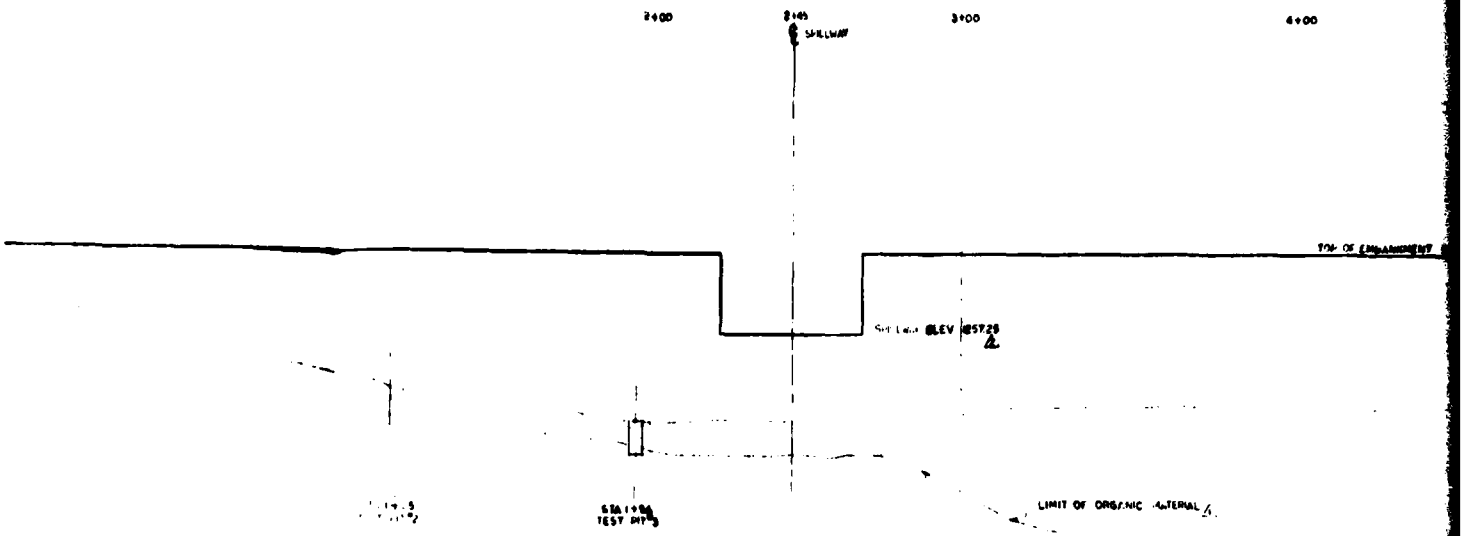
PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1257.30	1257.30	1260.80
STORAGE	163.	163.	432.
OUTFLOW	0.	0.	3325.

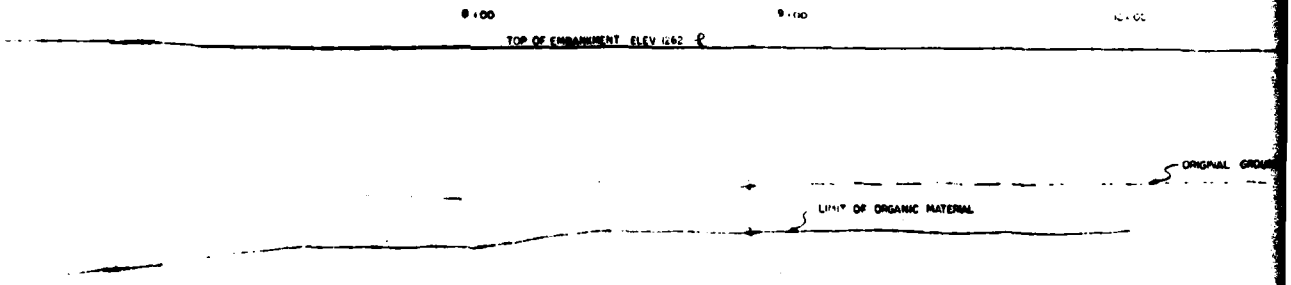
RATIO OF PMP	MAXIMUM RESERVOIR WtS.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.20	1258.86	0.00	270.	542.	0.00	43.00	0.00
.30	1259.24	0.00	300.	865.	0.00	42.67	0.00
.40	1259.55	0.00	324.	1193.	0.00	42.50	0.00
.50	1259.81	0.00	346.	1523.	0.00	42.33	0.00
1.00	1260.75	0.00	428.	3208.	0.00	42.00	0.00

APPENDIX E
DRAWINGS


Bear Rock Imp
TRAIL
Nicks Swamp
JEEP
DRAINAGE AREA BOUNDARY
Long Swamp
BM 1342
PRIVATE
N
Camp Speers
Nichecronk Pond
Townsend Swamp
TRAIL
DAM
Mowat Lake
Woodpecker Lake
Brook
Birchwood Lakes
Camp Marland
Nyce Lake
Nyce Lake
E-1
LAKE RENEE DAM
DOWNSTREAM EXPOSURE MAP
SCALE 1" = 2000'
L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS

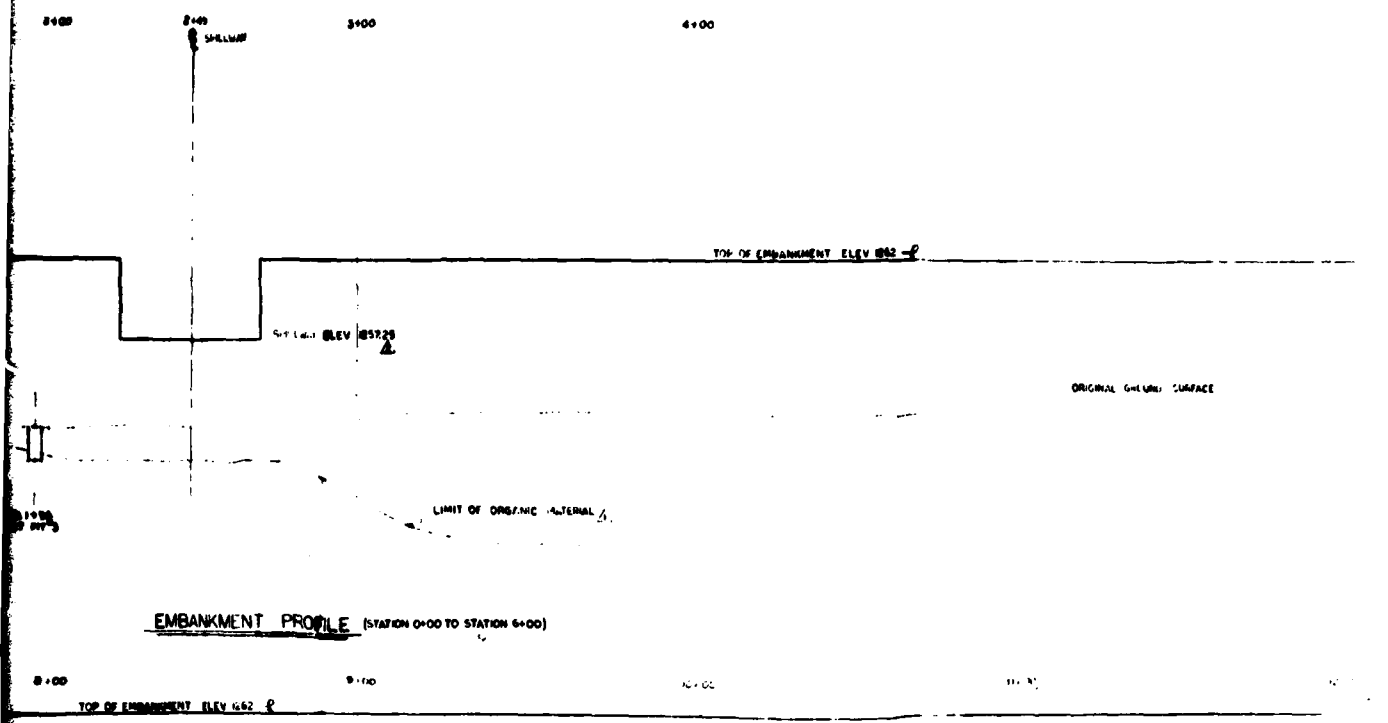


EMBANKMENT PROFILE (STATION 0+00 TO STATION 6+00)

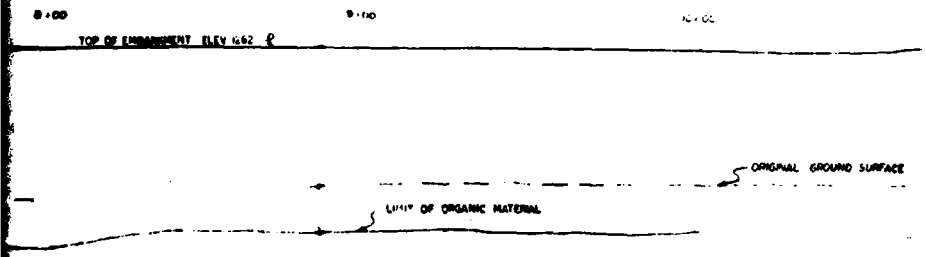


EMBANKMENT PROFILE (STATION 6+00 TO STATION 12+00)

SCALE HOR. 1"=
VERT.



EMBANKMENT PROFILE (STATION 0+00 TO STATION 6+00)



EMBANKMENT PROFILE (STATION 6+00 TO STATION 12+00)

SCALE: HOR. 1" = 50'
VERT. 1" = 5'

AS BUILT

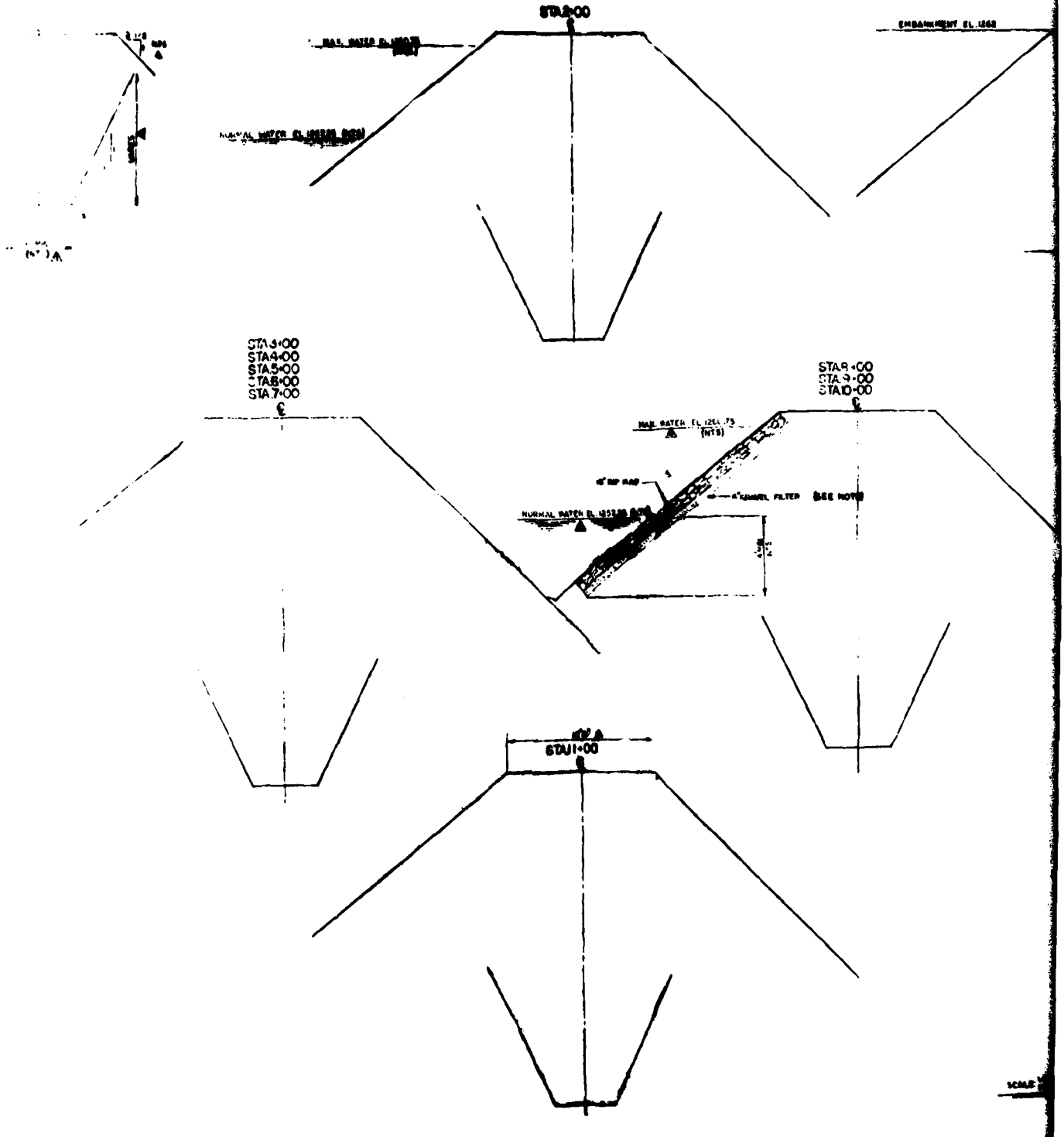
MARCEL LAKE ESTATES
Delaware Twp, Pike Co, Pa.

LAKE RENEE
EMBANKMENT - PROFILE

DATE: MARCH 9, 1972
SCALE: AS NOTED
DESIGNED BY: F.G. STEWART
APPROVED BY: L.R.K.

MONROE ENGINEERING, INC
EAST STROUDSBURG, PA.
DWG. No. M-72-212 D

2 E-2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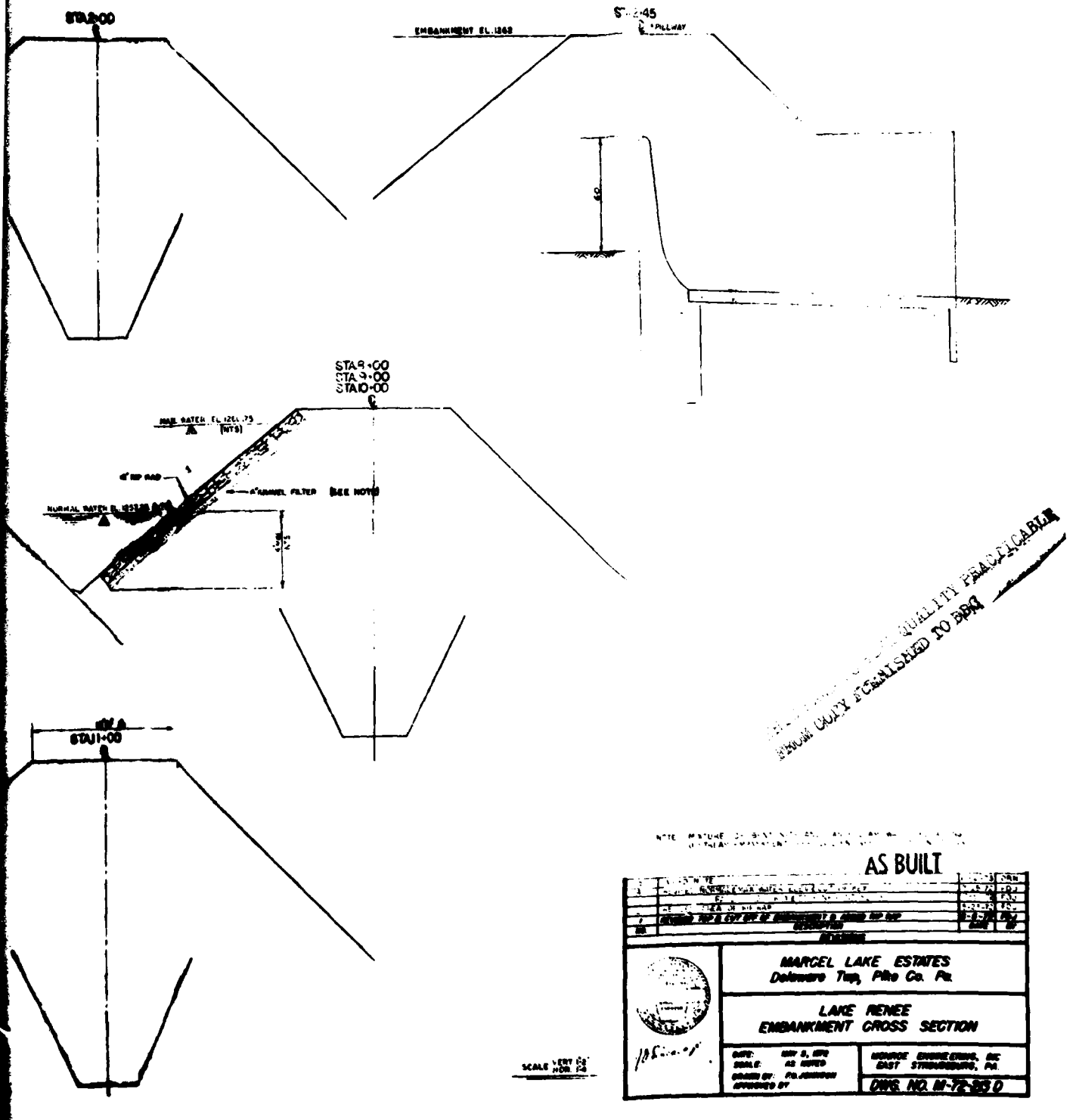
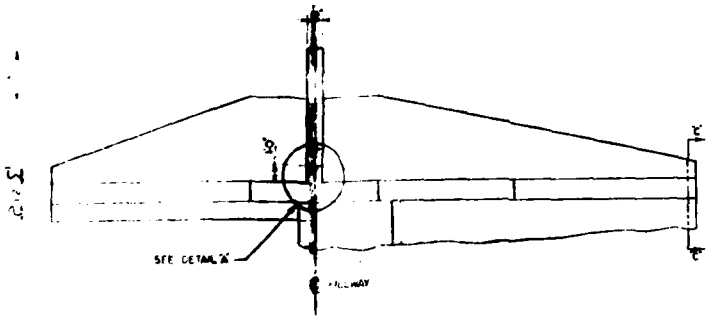


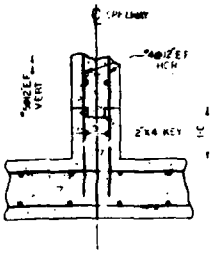
AS BUILT

	MARCEL LAKE ESTATES Delaware Twp, Pike Co. Pa.	
	LAKE RENEE EMBANKMENT CROSS SECTION	
	DATE: MAY 5, 1972 SCALE: AS NOTED DRAWN BY: P.G. JOHNSON APPROVED BY	HOWARD ENGINEERING, INC EAST STROUDSBURG, PA.
		DWG. NO. M-72-25 D

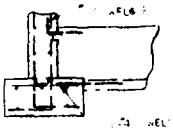
SCALE VERT 1/8"
HOR 1/8



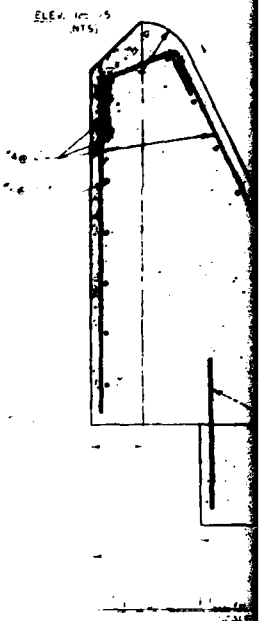
ABUTMENT PLAN
SCALE 1/8"=1'0"

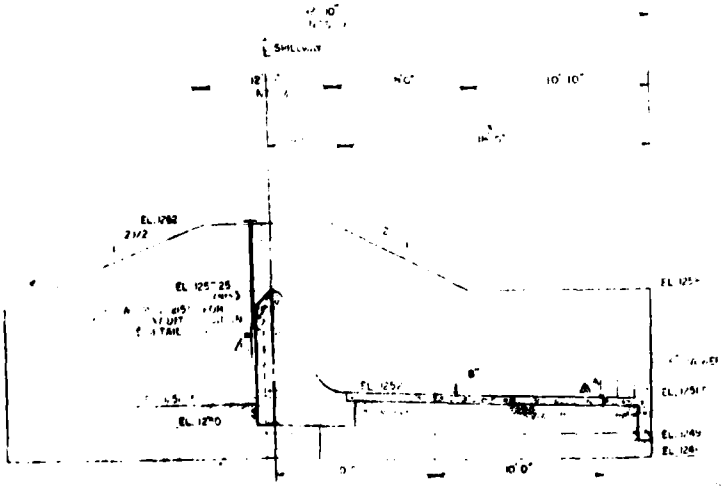


DETAIL A

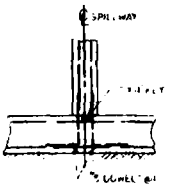


SECTION C-C

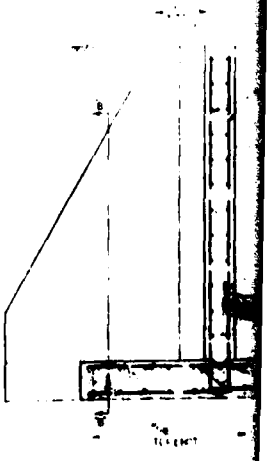


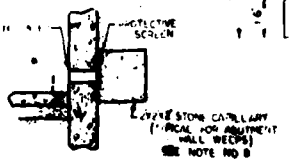


SPILLWAY ELEVATION - EAST ABUTMENT
WEST ABUTMENT OPPOSITE HAND
SCALE 1/8"=1'0"



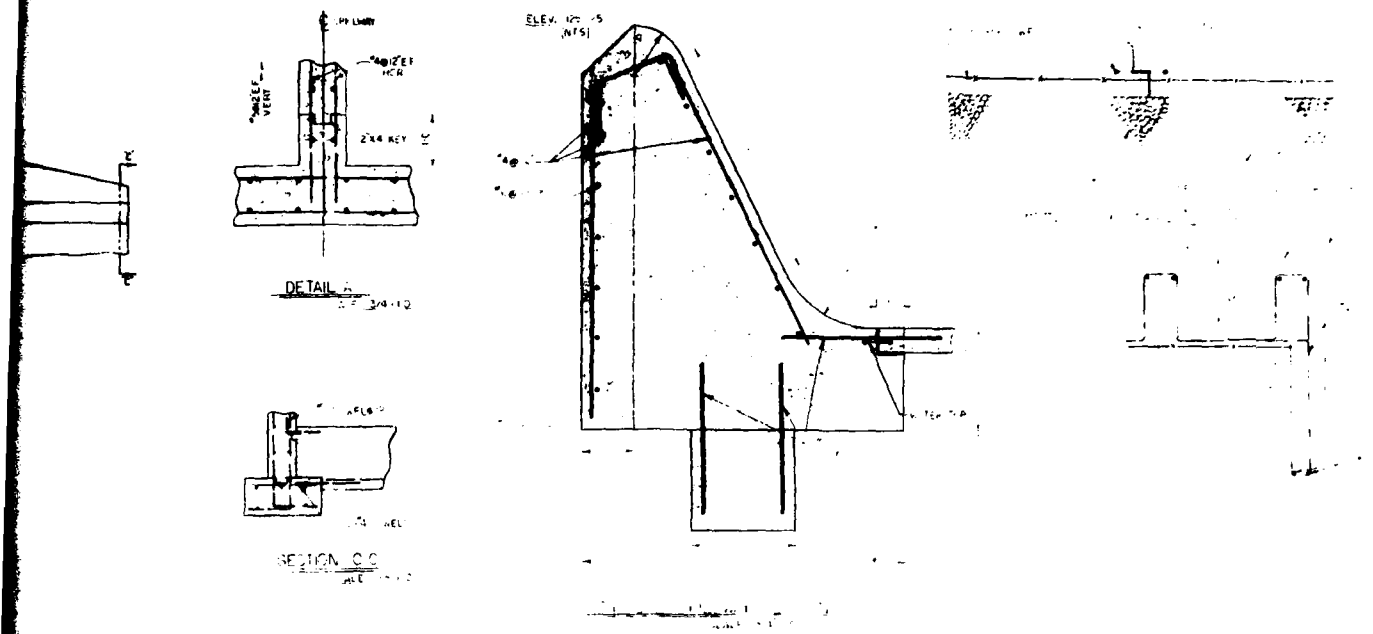
SECTION B-B

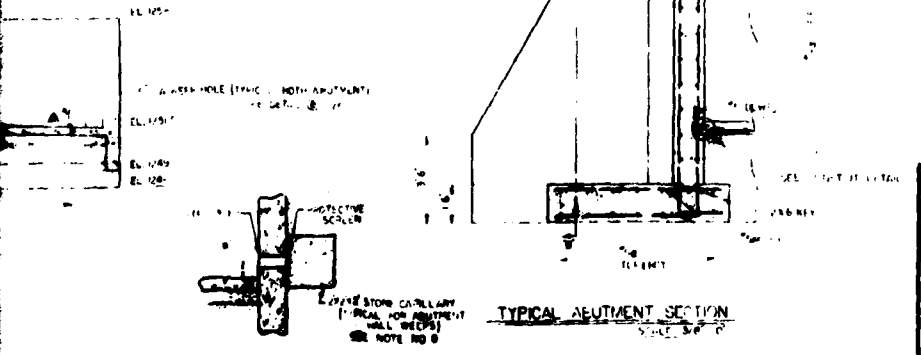




DETAIL B

TYPICAL ABUTMENT SECTION



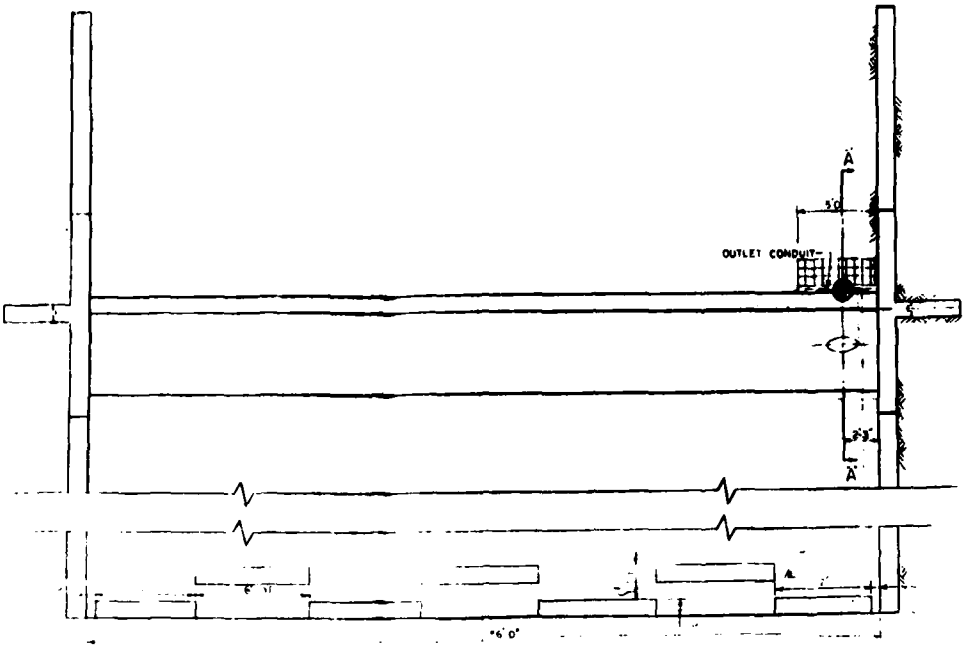


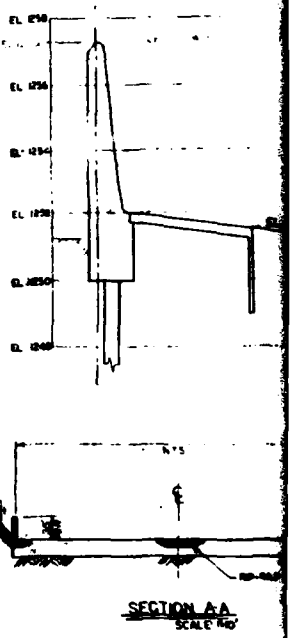
MARCEL LAKE ESTATES
Delaware Twp, Pike Co, Pa.

LAKE RENEE
SPILLWAY PLAN

RESPEC ENGINEERING, INC
EAST STROUDSBURG, PA

DWG No. M-79-2140


OUTLET CONDUIT
A
A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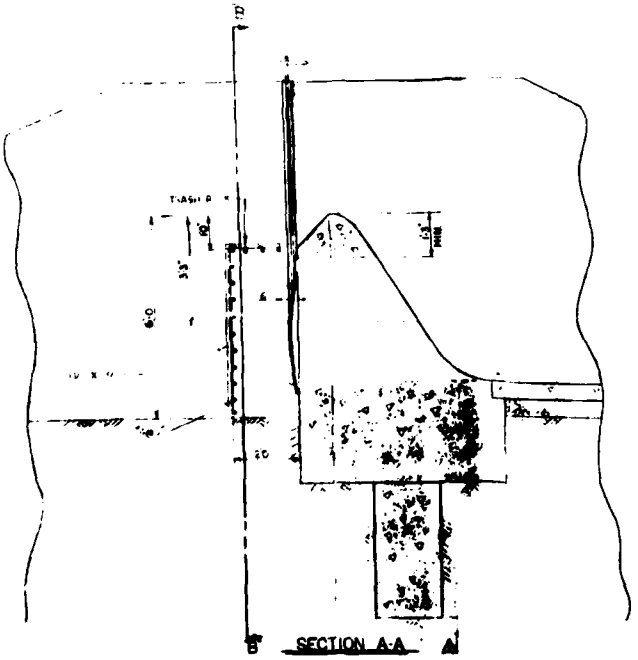
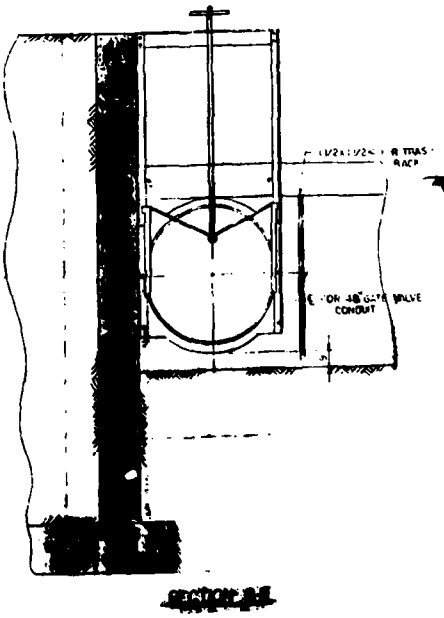
EL. 1254
EL. 1250


SECTION A-A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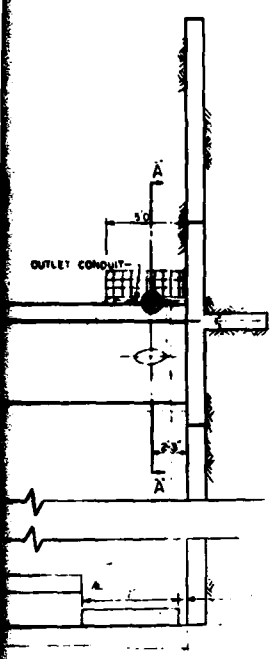
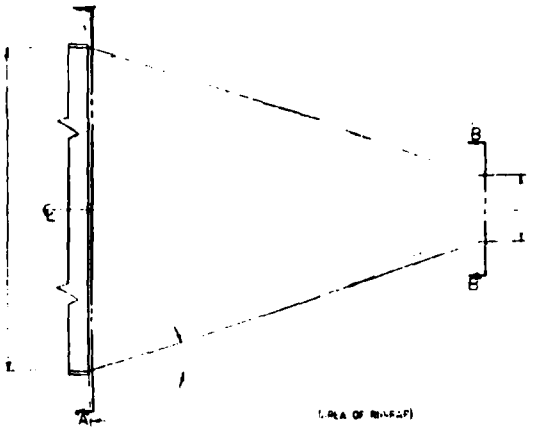
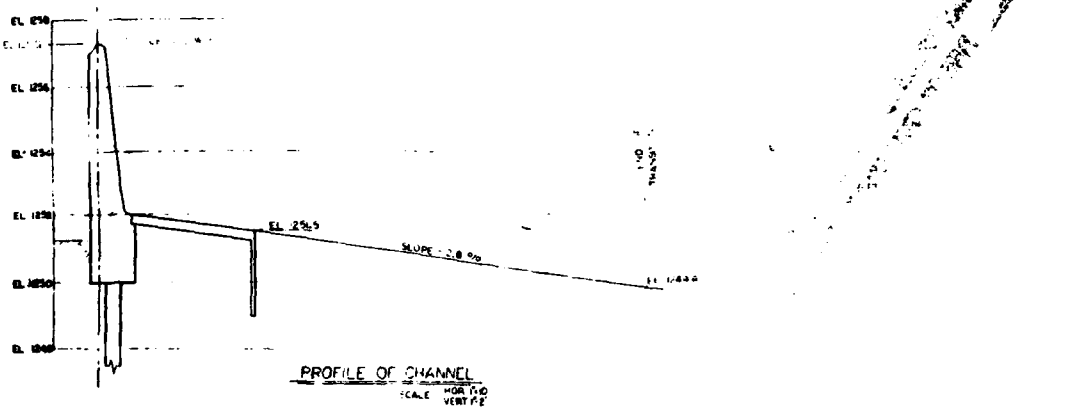
SECTION A-A

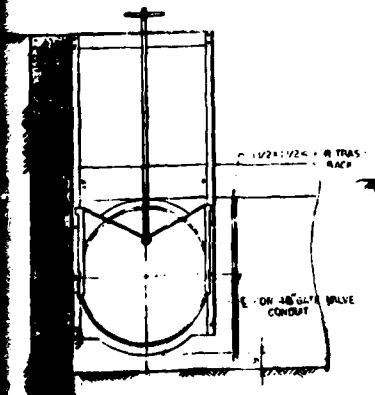


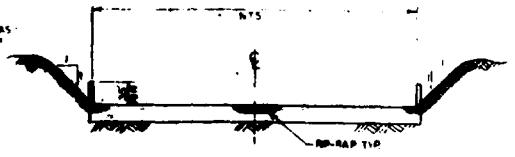


WASTEWAY CHANNEL



PROFILE OF CHANNEL





SECTION A-A

SECTION B-B

AS BUILT

MARCEL LAKE ESTATES
Delaware Twp, Pike Co., Pa

LAKE RENEE
WASTEWAY CHANNEL - OUTLET CONDUIT

MONROE ENGINEERING, INC.
EAST STROUDSBURG, PA.

DWG. No. M-72-28D

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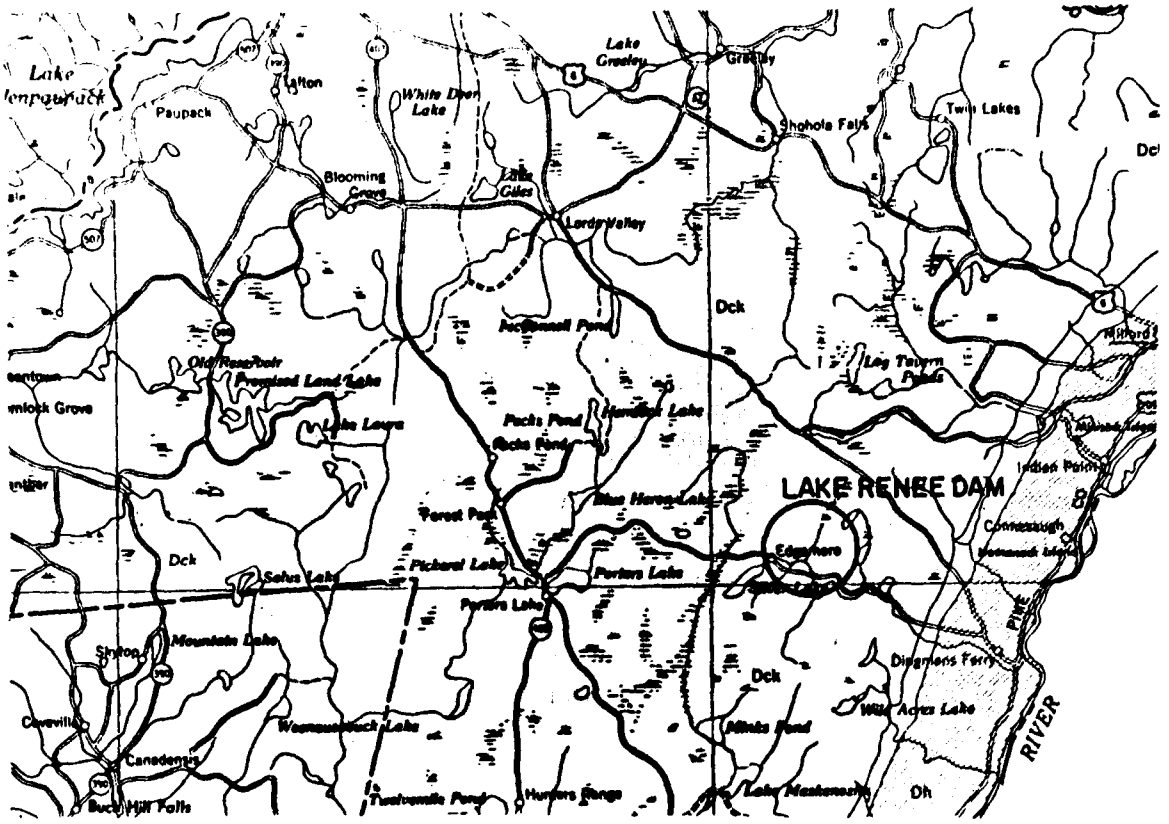
E-5

APPENDIX F
GEOLOGY

General geology

Lake Renee and its dam lie in the (Glaciated) Low Plateaus Section of the Appalachian Plateaus Physiographic Province. This area is characterized by broad anticlines and synclines and little, if any, faulting. No known faulting is indicated in the vicinity of the lake.

The bedrock underlying the lake and dam consists of the Devonian aged Catskill Formation. This is a complex unit of conglomerate, sandstone, siltstone and shale. The normally well developed beds range in thickness from less than one foot to over fifteen feet. The usually well developed joints are closely spaced and steeply dipping. The shales disintegrate rapidly, but the sandstones, siltstones and conglomerates are fairly resistant. The rocks can form a good foundation for heavy structures if excavated to sound material and the shales and siltstones are kept water free. The interstitial porosity is low in the coarser rocks, but the joint development creates a medium overall effective porosity.



GEOLOGIC MAP OF THE AREA AROUND LAKE RENEE DAM

SCALE 1:250,000

Dck — Catskill Formation

Chiefly red to brownish shales and sandstones, includes gray and greenish sandstone tongues named Elk Mountain, Honesdale, Shohola, and Delaware River in the east.